

Electric IR Curing Solves Productivity Problem

The Challenge: Increase Production and Improve Product Quality

Howard Industries in Laurel Mississippi manufactures a variety of pole-mounted and pad-mounted electrical transformers. The transformers, in most cases, are installed outdoors and are exposed to extreme weather conditions. Thus, a protective coating is required to prevent corrosion. In addition to corrosion protection, the coating must also be UV resistant and have excellent chemical resistance properties.

Jack Delk, Vice President and General Manager for the Single Phase Pad & Subsurface Division of Howard Industries needed to double production of the coating lines without utilizing additional floor space. The gas convection curing ovens, which were already at maximum capacity, were the most prominent limiting factor to increasing line speeds. Doubling the size of the ovens to accommodate increased line speeds was out of the question due to space considerations as well as increased energy consumption. A more efficient drying and curing process had to be found.

In addition to the increase in productivity, the company was also seeking to improve the appearance quality of the finishes that are applied to the transformers. The transformers are painted after assembly and contain temperature-sensitive components as well as oil. Thus, it was necessary to employ a curing technique that would not cause excessive heat build-up within the parts, but would still achieve complete cure of the coating.

The Old Method

The company used thermosetting liquid enamels for coating the products. The coating was force-dried and cured in gas convection ovens. The transformers were cleaned before painting and then coated

with automatic spray painting equipment. After painting, the transformers were transferred to a conveyor that traveled through the gas convection ovens for drying and curing of the finish. The line speed was 2 feet per minute.

The New Way

The engineers at Howard Industries consulted with their paint suppliers and with several manufacturers of industrial paint curing ovens to determine the best method for increasing productivity of the paint lines. Technical support personnel from Mississippi Power were also asked to assist in the investigation and make recommendations.

After running tests with high-velocity gas convection ovens, gas infrared ovens, and

electric infrared ovens they concluded that electric IR was the best solution for the problem.

High-velocity gas convection ovens were dismissed because of the significant airflow required and the probability of increasing air-borne contamination in the oven atmosphere.

Gas IR was rejected since products of combustion from the gas burners would be present in the oven atmosphere and could have a detrimental effect on the appearance and surface quality of the coatings.

Electric IR ovens required minimal air movement, produced no products of combustion, could be installed within the same area as the existing gas convection ovens, and the line speed could be



After paint application, transformers are conveyed to the IR oven where the coating is cured.

increased from 2 feet per minute to 4 feet per minute. For these reasons two new medium-wavelength electric IR ovens were installed.

The new ovens are each equipped with 280 medium-wave emitters that produce a total of 252 kW or 856,800 Btu of energy. The medium-wavelength electric IR emitters heat the surface of the parts to 300° F to provide maximum flow and leveling of the coating without overheating the internal components of the transformers or causing degradation of the cooling oil.

The Results

The new system has improved product quality, increased productivity, provided a cleaner and quieter workplace, and reduced overall operating costs. Since electric IR heats the surface of the transformers to the curing temperature of the coating before the entire mass reaches the curing temperature, the parts cool faster and can be handled almost immediately after exiting the IR oven.

Improved Quality

The new electric IR curing ovens provide controlled cure of the coating with minimal air movement. Surface defects from airborne contaminants have been reduced considerably. Solvent popping due to uncontrolled heat-up rates of the uncured coating has been eliminated. The more uniform heat-up rate and controlled cure of the coating have also enhanced the appearance of the finish. Gloss is more consistent and the "orange peel" effect has been reduced.

Increased Productivity

The new lines run at 4 feet per minute, versus 2 feet per minute with the old gas convection ovens. Productivity of the paint lines has been doubled and, because the

parts now cool faster and can be handled almost immediately after curing, downstream operations can be accomplished sooner.

A Safer, Cleaner and Quieter Workplace

The elimination of products of combustion from gas burners and the large ventilating fans required in gas convection ovens has improved working conditions

within the plant and provided a healthier workplace environment. Noise levels have been reduced and, because no combustible materials such as natural gas are used in the process, the possibility of fires has been reduced.

Reduced Costs

Electric IR ovens do not require extended preheating times. The ovens are turned on just before parts are ready to enter and turned off after the last parts exit. The gas convection ovens required approximately 1 hour preheating time before the first parts could be processed, and were not shut down for breaks and meal periods. Furthermore, the high heat transfer efficiency of electric IR, along with the ability to more precisely focus the radiant energy and control the heat-up rates of the parts, has resulted in less wasted energy.

The Bottom Line

Electric IR drying and curing has provided multiple benefits for Howard Industries. The company has improved quality, increased productivity, reduced emissions, improved the environment of the workplace, and reduced overall costs. The reduction in emissions has improved air quality for both the community and the plant, and the increase in productivity



Howard Industries Inc. is the nation's leading manufacturer of distribution transformers with over two million units in service throughout the world.

allows the company to meet production requirements. The reduction in operating costs will improve overall profitability of the company.

Assistance from Local Utility

Steve Armour of Mississippi Power conferred with personnel from the Georgia Power Technology Applications Center and was able to identify alternative drying and curing processes that would enable Howard Industries to increase productivity and improve quality. Steve provided the information to the process engineers at Howard Industries and, after evaluating all the alternatives, the old gas convection ovens were replaced with new electric IR ovens.

Other Applications for Electric IR Drying and Curing

Electric IR drying and curing is used extensively throughout the finishing industry on a wide variety of coated and printed products. Metal, wood, plastic, leather, and textile products can all be processed with electric IR. The technology is cleaner, safer, and quieter than gas heating technologies and, quite often, produces superior finishes. Many coatings and inks are now being specifically formulated for use with IR heating.

Photographs courtesy of Outdoor South

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